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Speech Recognition for Agriculture based Interactive Voice Response System

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ABSTRACT: *Speech is the most desirable medium of communication between humans. The goal of speech processing is to provide natural interfaces to human –computer interaction through speech input and speech output capabilities in Regional languages. Speech being a natural mode of communication among human beings has the potential of being primary as well as convenient mode of interaction with computers. It is desirable to have a human computer dialogue in audio mode to take place in local language. Marathi is one of most widely used language in Maharashtra. The Interactive Voice response system is well known application of speech processing. This paper explores a new approach of IVRS system for agricultural assistance to farmers in Marathi.*

Keywords: *IVRS, Speech Recognition, CSL*

I. Introduction

The prevalent mode of human computer interaction is via a keyboard or a pointing device for input and visual display unit or a printer for output. In this age the machine oriented interfaces restrict the usage to minuscule fraction of the population, who are both computer literate and conversant with written English. This calls for human oriented interfaces with machines. Speech occupies a prominent role in human interaction. Thus, it is natural that people are expecting speech interfaces with computers [1]. It is possible that a computer speech interface permits spoken dialogue in one's native language. The advantage of this is that the majority of people can be benefit from this technology, when they are able to interact with computers in their native language. This advantage emerged with the automatic interactive voice response system (IVRS). There is various IVR systems for automated Attendants, ACD Systems, Call Distribution, Alerts & Reminders, Card Activation, Hotlines and Helpdesk etc [2].

The purpose of IVRs is mostly to make the initial process of answering and routing a call more efficient. Instead of talking to a live person, the caller is greeted by a pre-recorded voice coupled with technology that is capable of Understanding words the caller speaks or selections he/she makes using the phone keypad. When implemented correctly, an IVR can help people perform transactions or get answers over the phone faster than they would by speaking to a live representative. Many people, , appreciate the ability to quickly check the balance on a bank account, book a flight reservation with an airline, or refill a medical prescription. Most consumers are familiar with the well-established IVR that uses keypad selections to direct callers through a series of pre-recorded menus. Most advanced systems now include voice recognition, allowing callers to speak commands rather than punching in numbers. This type of advanced solution is most appropriate labeled "interactive voice response," since it involves not only the voice of the pre-recorded message, but also what the caller says. Early speech-recognition features for IVR systems weren't very sophisticated, but they have been greatly improved in the past few years. These systems can now understand not just words like "yes" and "no" but names and strings of numbers as well with a high degree of accuracy. Yet another technology, text-to-speech (TTS), is now being coupled with speech recognition to make IVR systems more flexible. Customized text — such as details of a bank account balance or specifics for an airline ticket — can be created, and then read to the customer by a computerized voice. This removes the limits placed by having to pre-record all information presented to the caller. Thus this paper focuses on the use of speech recognition technology for interactive voice response system for agriculture assistance to farmers.

The rest of the paper is organized as follows. The creation of Marathi speech database related to agricultural application is presented in section 2. A concept of AGRO IVRS is presented in section 3. An account of Experimental analysis is detailed in section 4. Section 5 presents results and conclusion. This paper focuses on the use of an IVRS system for an agricultural assistance.

II. Marathi Speech Database

For accuracy in the speech recognition, we need a collection of utterances, which are required for training and testing[3,4]. The Collection of utterances in proper manner is termed as database. The generation of a corpus for Marathi sentences as well as the collection of speech data for AGRO IVRS is given below. In this application, we maintained three set of database. One database corresponds to the names of the crops, second for queries regarding the infection symptoms of crops and third with the name of the disease and its solution. For testing the age group of speakers selected for the collection of database ranges from 20 to 30. Mother tongue of speakers was Marathi. The total number of speakers was 35 out of which 17 were Females and 18 were Males.

The vocabulary size of the database consists of:

- Database with the names of the crop = 5 * 35 =175 samples
- Database with the infection symptoms = 5 crops * 2 symptoms * 35 = 350 samples
- Names of the disease = 2 disease * 5 crops = 10 samples
- Solution database as sentences = 5 crops * 2 solution = 10 samples ***a. Acquisition setup***

To achieve a high audio quality the recording took place in the10 X 10 rooms without noisy sound and effect of echo. The Sampling frequency for all recordings was 11025 Hz in the Room temperature and normal humidity. The speaker were Seating in front of the direction of the microphone with the Distance of about 12-15 cm [5]. The speech data is collected with the help of Computerized speech laboratory (CSL) using the single channel. The CSL is most advanced analysis system for speech and voice. It is a complete hardware and software system with specifications and performance. It is an input/output recording device for a PC, which has special features for reliable acoustic measurements [6].

III. Agro Interactive Voice Response System

Agriculture has been the primary occupation of human being. Agriculture in India is the means of livelihood of almost two thirds of the work force in the country. It has always been INDIA'S most important economic sector. Generally farmers do not have the scientific information about diseases of crops and their solutions. Farmers don't wish to go to the Agro information Centre or visit the agro web site for their queries related to the crops. Even they have the problem with understanding language and typing. To facilitate the farmer having information regarding the solution with the crop diseases through their phones (land line or mobile), we propose a model with voice response in Marathi language. This model will be advantageous in following conditions: People with disabilities that prevent them from typing.

- Illiteracy of farmer that keep him away from the automatics systems.
- Lack of source to get the information.
- To save the time to find the information.
- For visually impaired users when it is not possible or convenient to use a Braille keyboard,

Today, many IVR systems are based on voice extensible markup language (VXML). This system has five main components: [7]

a) A phone network (PSTN or VoIP) through which calls are routed, a TCP/IP network for Internet/intranet connectivity,
b) A VXML phone server which acts as an interpreter between the caller and the information they're accessing, a Web/application server to house the IVR software applications,
c) And a database from where information is accessed by the IVR applications.

The unique point of voice interfaces is the ability to access an information system remotely. The ubiquitous telecommunication system enables one to access information on an "anytime anywhere" basis [8]. The proposed model of AGRO IVRS is shown in figure 1. A Computer Telephonic card will be used to setup data collection environment. Once the farmer comes online, working of IVRS systems starts, which is as follows:

1. The call will be connected to IVRS.
2. The System will prompt user to tell the name of the crop.
3. The System will prompt user to tell the symptoms regarding the crops.
4. The searching time will be communicated to the user (i.e. User will hold for some time)
5. Depending on the symptoms the database will be searched in IVRS database and the result will revert back to the user.

6. The Agro IVRS will prompt for the continuation, if user want to continue with other symptoms the system will start by step 3 else it will thank the user and terminate.

The proposed IVRS model will be advantageous to farmers as it is will provide, in--hand solution for the diseases of the crops on 24/7 basis.

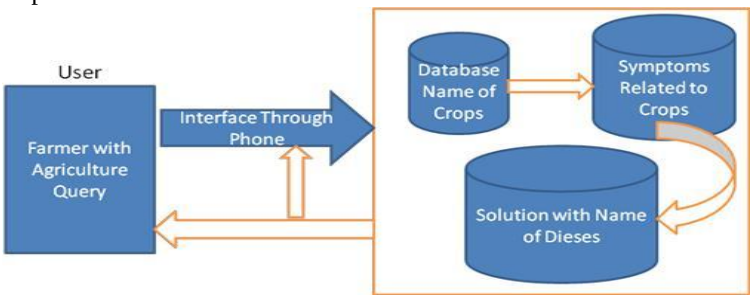

FIGURE 1 MODEL OF AGRO IVRS

IV. Experimental Analysis

The Experiment of Agriculture based Interactive Voice Response System is based on Speech Recognition. In this the query from farmer is given to the system for recognition .the time for training comes to one minute forty second ,where for testing (recognition) one minutes for 260 continuous sentences .The process is divided into two parts, first parts is identification of keywords from query and second part is recognizing the sentences using the keywords. The performance of system in term of recognition is done using word error rate. The recognition performance for accuracy is shown in table 1.

Word error rate can then be computed as

$$WER = \frac{S + D + I}{N}$$

Where

- S is the number of substitutions,
- D is the number of the deletions,
- I is the number of the insertions, N is the number of words in the reference

When reporting the performance of a speech recognition system, sometimes word recognition rate (WRR) is used instead.

$$WRR = 1 - WER = \frac{N - S - D - I}{N} = \frac{H - I}{N}$$

Where

- H is N-(S+D), the number of correctly recognized words

Table 1: Recognition performance for accuracy

Sr. No	Gender	Sentences Passed	Sentences Recognize	Accuracy
1	Male	50	46	92. %
2	Female	100	90	90%

V. Results and Conclusion

We presented an account of creation of Marathi language speech database with respect to agriculture. When tested it is been observed that the overall recognition rate of system comes to be 91%. We tried to use the created database for the prototype application of AGRO IVRS system. The corresponding application should be valuable for training speaker independent, continuous speech recognition systems for Marathi language as well as the IVRS model can further be extended to various sectors related to agriculture.

REFERENCE

[1]. K Samudravijaya "Speech input/output systems in Hindi " Tata Institute of Fundamental Research , Homi Bhabha road,Mumbai 400005

[2]. The Interactive Voice System [online]http://www.hjelectronics.com/ivr_intrective_voice_response_system.html viewed on 1 Jan 2011.

[3]. Santosh Gaikwad ,Bharti Gawali ,Pravin Yannawar " A review on speech recognition Technique" International Journal of Computer Applicatin Bharti Gawali, Santosh Gaikwad, Pravin Yannawar, Suresh Mehrotra " Marathi isolated word Recognition system using MFCC & DTW features" ACEEE Dec 2010.

[4]. The website for The Disordered Voice Database Available [online]http://www.kayelemetrics.com/Product%20Info/CSL%20Family/4500/4500.htm viewed on Jan 2011.

[5]. Burkhardt, A. Paeschke, M. Rolfes, W. Sendlmeier, B. Weiss, "A database of German Emotion Speech", INTERSPEECH 2005, September, 4-8, Lisbon, Portugal

[6]. IVRS Article [online] http://www.tmcnet.com/channels/ivr/articles/43969-introduction-ivr.htm viewed on 2 Jan 2011.

[7]. Samudravijay K "Marathi speech database by samudravijaya" Tata Institute of Fundamental Research , Homi Bhabha Road, Mumbai.